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REPORT OF A CASE OF DIABETES MELLITUS IN WHICH DOUBLE CATARACT EXISTED:

DEATH OCCURRING THREE DAYS SUBSEQUENT TO AN OPERATION OF EXTRACTION.

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WHILST on a professional visit to Bedford Springs, Penna., in the month of April, 1879, in consultation with Dr. Griffith, I was asked by Dr. Gump of that place to see with him a young man who was suffering from diabetes mellitus. The following brief history relating to his attack was obtained :—

J. Z. B., single, aged 30 years, had been a clerk in a dry goods store for sixteen years. In November, 1874, he had an attack of pneumonia, from which he recovered well. Whilst suffering from great mental anxiety and worry, caused by a "cross in love," he had what was described as a very "light" convulsion on October 4, 1876. From this time until July 18, 1877, he was in fairly good health, although still suffering from mental distress. At this latter date he had a succession of violent convulsions, lasting for four or five hours, and following this attack he was quite ill for three weeks. The exact nature of these convulsive seizures could not be ascertained, though they were thought to have been epileptiform in character. About the middle of the month of December, following, the patient complained of excessive micturition. On submitting the urine to examination, it was found to

contain a small quantity of sugar, which increased in amount rapidly, so that by January 25, 1878, it was reported to contain a very large quantity, and the daily secretion of urine was three gallons. The treatment which was adopted afforded some relief, but the patient declined to continue it for a longer period than a month.

According to the statement of his attending physician, the patient gradually lost flesh and strength, so that I found him, at the time of my visit, fifteen months later, much emaciated and anæmic. His pulse was feeble but not very rapid—86 to 90 per minute; his tongue was moist, red, and free from coating; skin dry and harsh; bowels in quite good condition. He did not complain of excessive thirst or dryness of the mouth. He appeared much distressed on account of increasing loss of vision, which was found to be due to double cataract—complete lenticular opacity being present in the right eye, with partial and progressive change in the left lens. As he had not been under the immediate care of his physician for some time, the changes in the lenses had not been observed, and no information could be obtained with regard to the time at which the degeneration began, other than the statement of the patient to the effect that he had noted failure of vision during the past few months.

He was very anxious that something should be done to relieve the approaching blindness, which he feared would soon render him helpless. I advised against any operative procedures at that time, owing to his enfeebled condition, stating, however, that, if he improved under treatment and would come to the city, I would consider the propriety of an operation for his relief. I suggested that he should be treated by the administration of ten grains of iodide of potassium three times daily, and that his diet should be restricted to skimmed milk, a pint being given every three hours; if needed, beef-tea and eggs were to be added to his diet, but no starchy food was to be allowed. Under this plan of treatment he improved decidedly and rapidly; the daily secretion of urine decreased from twenty-four pints to six pints, and its

saccharine condition was also notably changed, the quantity of sugar being markedly diminished. This improvement occurred in the interval from the time I had seen him in April, to June 4, when he came to the city, a period of less than two months. Feeling so much improved, he had come to the city for the purpose of having the operation of extraction performed, and was very earnest in his entreaties that it should be done.

After consultation with Dr. Schell, whose report of the operation and the subsequent condition of the patient I append, I decided to perform extraction upon the right eye. Desiring to place the patient in a favorable condition for the operation, I withdrew medication and placed him upon a highly nutritious diet. Whilst this plan of preparation was being carried out, he was, unfortunately, subjected to great mental anxiety by the behavior of his attendant, upon whom he was entirely dependent. Knowing the great importance of having him free from all depressing influences, I stated that I would decline to operate unless I received assurances that all causes of trouble were removed, and that he was entirely free from anxiety. Receiving these assurances, I continued the preparatory treatment, and on June 9 performed extraction upon the right eye, the report of the operation being given by Dr. Schell, as follows:—

"By the request of Dr. Mears I visited Mr. B. in consultation with him on June 7. The patient, though not well nourished, in consequence of an attack of diabetes from which he had suffered for some time, was otherwise in fair condition. His skin was soft and moist, and his pulse 78 per minute, soft and elastic. In both eyes the crystalline lens was found to be cataractous; on the right side the cataract was fully formed, soft, and ripe; on the left side it was not quite mature, there still being a small quantity of transparent cortical matter at the equator of the lens. Vision was limited to light perception in both eyes, with entire absence of retinal reflex; otherwise the eyes appeared to be quite healthy. The

corneæ were clear, the irides mobile, tension normal, and projection of light excellent. As the patient was very anxious to have his sight restored and to return to his home, it was decided to operate, on at least the right eye, at once.

"In pursuance of this conclusion, two days later, *i. e.* on the 9th of June, the patient was anæsthetized by means of sulphuric ether, and succumbed to its influence readily. Dr. Mears performed the operation by making a peripheral incision upwards in the cornea, lacerating the capsule with the point of the knife during its passage through the anterior chamber, and readily expressing the soft lens with the spoon without iridectomy. After the instillation of atropia the eye was bandaged in the usual manner, and healed in two days without inflammatory action. The pupil appeared round, clear, and black under lateral illumination, and the patient expressed himself as delighted with the fact that he was able to see when the bandage was removed in the interval of the dressings. As far as the eye was concerned, the operation may be considered to have been a perfect success."

Noting the condition of the patient after the operation somewhat more in detail, it may be stated that he came out of the state of anæsthesia quietly and calmly; the operation did not produce shock, and no nausea was present. In the evening of the day of the operation, he took nourishment, was free from pain, and during the night slept very well. The day following, June 10, his condition was in every way excellent; he was cheerful and contented to remain quietly in bed. The quantity of urine had not increased, and his desire for liquids was not abnormal. The pulse was increased in frequency, which condition had been noted to exist since the operation. The next day, on removing the bandage, he appeared much pleased at the fact of his being able to see out of the eye upon which the operation had been performed. His condition was regarded as so favorable that arrangements were made to permit him to sit up on the next day. On visiting him, however, in the middle of the afternoon, a very

perceptible change in his condition was noted to have occurred. He was very much depressed in spirits, and manifested great restlessness; his respirations were markedly increased in frequency, being thirty to the minute, and his pulse was quite rapid, 98 to 100 per minute. There was no febrile movement, nor any evidence of inflammatory action present. Learning that some trouble had occurred between his attendant and himself, I attributed the changed condition as largely due to excitement, and spoke to him of the necessity of avoiding it in his present condition, and cautioned the attendant against any action on his part which would provoke it.

Returning at ten o'clock at night, I found his condition worse; respirations 40 per minute, and very shallow; pulse small and rapid, 110–114 per minute; temperature normal; slight delirium present. By an effort he could be made to answer questions. Bromide of potassium in twenty grain doses had been given every two hours since the visit in the afternoon, without producing any effect. Tincture of aconite was ordered in doses of three drops, combined with the bromide of potassium. The remedies failed to afford any relief, and at three o'clock in the morning of the day following, death occurred. Towards the end, the delirium was more marked, the respirations were very rapid, pulse 120–124, and convulsive movements were present, as manifested by twitchings of the upper and lower extremities. Permission was obtained to examine the brain, and the examination was made two hours and a half after death by Dr. Morris Longstreth, whose report I present herewith.

"*Post-mortem Record of Mr. B.*—June 12, 1879. Duration 1¼ hours; 2½ hours after death, *Rigor mortis* slightly developed. Surface of body pale. Face emaciated. Head only examined. The deeper parts of the scalp and the pericranium were much congested. The skullcap was very much thinned in places, and the same condition was found on the parts of the temporal and occipital bone attached to the base of the skull.

"The *dura mater* was very bloody and its vessels unusually prominent; the membrane was tensely spanned over the brain; in places it was very tightly adherent to the bone, both over the convexity and at the base; the adhesion was not general, but was confined to small spots and areas. At these places, as traced by slight tearings of the membrane or by shreds of its tissue left in contact with the bone, the dura was found thickened and rough. The cerebral surface of the membrane at these places presented a mammillated appearance, and around them the membrane was injected. The summits of several of these growths felt harsh and were apparently calcareous, probably due to changes in the bone beneath. The number of places affected in this manner was about twenty. The character of the growth was that of small fibroid nodules.

"The *arachnoid* was entirely opaque and whitish in very many places, especially along the sulci of the cerebrum and also at points opposed to the dura mater growths, as was accurately traced in several instances. Although the dura was removed with care, it is not known that it was adherent to the arachnoid at these places, except at one place where the union of the growth to the arachnoid was found to be very intimate. Along the longitudinal sinus the union of these two membranes was very close, there being a large amount of fibrous and lymphoid structure; it was especially marked at the vertex where the large veins empty into the sinus. Beneath the arachnoid there was a very large amount of clear serum, which in many places caused an upward bulging of the membrane, and also a slight separation of the convolutions. The convolutions, except at these places, were slightly flattened.

"The vessels of the *pia mater* were very full of blood, and over nearly the whole surface of the cerebrum the smaller vessels were found very markedly injected.

"At the *base* of the brain, the *vessels* of the circle of Willis presented nearly normal appearances; at a few places atheromatous changes were visible, especially at the termination of the carotids, and at one or two places on the basilar artery.

The membrane in the interpeduncular space was thickened and opaque. The nerve trunks appeared normal, except the right optic nerve, which was less consistent than its fellow, and was somewhat flattened; no change was found in the commissure or in either optic tract. A considerable amount of serum escaped on division of the infundibulum, and continued to ooze afterwards on handling the brain.

"On opening the *lateral ventricles* there was still present a considerable amount of serum, and the cavity of the ventricles was evidently stretched, especially the posterior horns. The foramen of Monro was widely opened. The choroid plexus was very full of blood, and its surface was slightly granular, as well as that of the ependyma of the lateral ventricles. The septum lucidum was firm. The vessels of the velum interpositum were very full of blood. (Careful search was made later for any cause of obstruction to these vessels, but none was found.) The third and fourth ventricles were also stretched, especially the latter; their interior structures were normal except the middle commissure of the third, which was softer than normal (apparently from stretching).

"The *brain tissue* was apparently normal; there was no abnormal coloration and no softening found at any part. Except near the surface of convolutions, the puncta vasculosa were not unduly prominent (considering that the skull was opened and examined first), but at these parts, in places, the vascularity showed more distinctly than usual.

"The *base of the skull* (interiorly) was very uneven, the furrows and crests, for the accommodation of the convolutions, were very marked, and several of the crests, especially in the middle fossæ but also at other parts, were elevated more than a half inch. The condition was more than an exaggeration of a normal condition, for several of these *cristæ* were thickened at their summits and roughened, the surfaces presenting a spongy appearance.

"In the examination of the *tentorium* (while searching for an obstruction in or around its straight sinus), a growth, similar to those occurring at other parts of the dura, was

found on its under surface in close connection with the right fifth (trigeminal) nerve. The nerve was examined, but no change could be distinctly pointed out in its substance; its trunk, however, had been cut in removing the brain directly at the point where the growth occurred on the membrane.

"The *calvaria* showed moderately marked depressions for the Pacchionian bodies, but at four or five places, especially a marked one on the left frontal bone, the internal plate was completely eroded, and the diploe was opened. None of these places were larger than a pea, and their surfaces were rough and spongy. The crests and furrows on this portion of the skull were less marked than on the base. The petrous bones on both sides were not removed for examination, but neither the dura mater covering them nor the bone tissue, examined after the removal of the dura, showed any evidence of inflammatory disease of the parts having its origin in the external or middle ear.

"*Remarks.*—The changes found in the bone tissue within the cranial cavity, as well as the alteration in the membranes and the intracranial circulation, all point to the conclusion that the commencement of the patient's troubles dated back to a period some considerable time previous to his death. Of the character and nature of the changes found there seems to be little that can be said with certainty. The minute growths on the dura mater were clearly of a fibrous character, and therein resembled the fibroid tumors which not unfrequently have their seat on this membrane. The cause of the little growths found in this case is equally obscure as that of the larger masses spoken of.

"On the relationship or connection of the diabetes mellitus and the cataractous change in the crystalline lens, and on the occurrence of either of these pathological phenomena, the autopsy throws no absolute light; nevertheless there are one or two points to which it may be well to call attention, and to broach the question of the relationship of the marked alterations of intra-cranial circulation to diabetes, on the one

hand, and of the growth near the fifth nerve and the disease of the lens, on the other hand. It is well proved that pathological changes within the cavity or in the floor of the fourth ventricle or of the parts immediately beneath, in the medulla oblongata, are followed by or are the cause of a diabetes. While nothing was found in this case indicative of any organic change in the tissues of the medulla oblongata, there was much to show that for some considerable time a condition of the cranial circulation had been maintained which must have produced a distension of the cerebral ventricles, the fourth ventricle along with the others, and that thus the floor of the ventricle must have been pressed up in an abnormal manner. (The construction of the basilar portion of the occipital bone and of the foramen magnum were such as to favor and exaggerate the effects of such a distension of the fourth ventricle in pressing the tissues of the medulla.) This pressure, varying with the condition of the cerebral circulation, would produce a corresponding variation in the symptoms, viz., the diabetes.

"The simultaneous occurrence of diabetes mellitus and a cataractous condition of the crystalline lens, whether related as cause and effect or not, and the untoward results of operative measures—at least so far as the eye itself is concerned—for the removal of the cataract, are well known. Whether the cataract in this case had any connection with previous existing diabetes, as before remarked, the autopsy gives no answer. From the condition of the eye operated on, the answer can be made that this organ did not follow the general rule; it did not suppurate or degenerate as it usually does following cataract operations in diabetic patients.

"In regard to another explanation of the cataractous change in the lens, it may be worth while to call attention to the small growth found on the tentorium, closely related to the right fifth nerve. There are several cases on record of growths on or about this nerve producing cataractous or other ocular changes in the corresponding eye, as well as, of course, in other parts supplied by the same nerve. Whether it is possible that

a very limited lesion of this nerve trunk—so small a change as not to be visible to the unaided eye—can produce limited lesions in a peripheral part, *e. g.*, the lens, of course the autopsy of this case does not dstermine; it is a question that the further study of this nerve and its morbid changes only can answer."

As the interest in the above case relates especially to the condition of cataract and the results following operative procedures, I desire to invite attention more particularly to these points. The history of the case, as well as the pathological conditions revealed post-mortem, clearly establish the cause of the disease to have been located in the nervous system, taking origin in the mental emotion—"perturbation of the brain"—to which the patient was subjected and which continued to act for a long period, changing its form as the disease advanced, but still exercising its influence upon the patient until his death.

The occurrence of cataract in diabetes mellitus and their pathological relations have long been known and studied. Various explanations have been offered to account for the production of the lenticular opacity. That which proposed to account for the change upon the theory of osmosis (B. W. Richardson, *Journal de la Physiologie, etc.* [Brown-Séquard], t. iii.)—"the passage of the fluids of the lens by exosmosis to the unnaturally dense blood without" (the density being due to the presence of the sugar), causing a "precipitation within the lens of calcareous and other matters" and thus opacity, has not received the approval of more recent observers. Later observations have seemed to show that the degenerative change which occurs in the lens is one of the class "known to be

correlated in the way of nutrition or rather of malnutrition with the diabetic state." (*Brit. and For. Medico-Chirurg. Review*, vol. xxx., 1862.)

It would be interesting to determine by an examination of cases in which lenticular opacity has been reported as having been present, whether the causes in these cases were, as in this case, of nervous origin. In a small number of cases which I have examined, this observation was made. Should the examination of a larger number of cases prove this observation correct, the conclusion might be drawn that the cataractous lens occurred only in those cases in which the cause of the disease was due to some morbid condition existing in the nervous system.

With regard to the performance of operations for the relief of cataract in diabetic patients, Dr. Dickinson (*Diseases of the Kidney*) makes the following statement: "Surgery in such cases is attended with unusual danger: first, from consequent suppuration to which diabetic subjects are especially prone; and secondly, from the likelihood that even if the wound heal well, the patient may be dangerously depressed by the successive action of apprehension before the operation and darkness and restraint after it." He alludes to a case, in his own experience, in which the patient died after an operation which, locally, was perfectly successful. He further states, however, that cases are reported in which the operation has been followed by satisfactory results, "though the perils which environ it are such as to justify its performance only in exceptional circumstances."

Profoundly impressed with the dangers which surrounded operative procedures in such circumstances,

I performed the operation in the above case in response to the patient's earnest wish for surgical relief, and with the hope of removing an obstacle to improvement of his general health, by reason of its interference with his exercise in the open air, and the depression of spirits which the condition of almost total blindness produced. With regard to the method of operation in removing the cataractous lens in these cases, the linear is to be selected in preference to the flap operation, as by this method the wound is much smaller and the danger of suppuration is greatly lessened.